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WO 94/05356 A1 WO 91/00750 A1 US 5188601 A
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INT CL[6] A61M 5/32

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(54) Retractable needle assemblies for preventing re-use

(57) Needle assemblies wherein a used needle 2 is withdrawn into a syringe barrel 1 or tube (not shown). In the first embodiment consisting of a syringe, the plunger 3 is also broken off along line 4 to prevent re-use. A barrel end cap 5 is provided to shield the tip of the withdrawn needle 2. The end cap 5 is attached to the distal end of the barrel 1 and has a shield which projects into the barrel 1 and surrounds the tip of the needle 2.

An alternative end cap may also contain a flexible (e.g. rubber) projection into which the needle tip penetrates and helps to retain said cap in position (not shown).

Also described is a second embodiment of needle assembly (not shown) for use in dialysis and the like wherein after use the needle is withdrawn into a tube and held in place by deflectable sliders. An end cap 5 as described above is attached to the distal end of the tube to protect the needle and prevent blood loss from the tube.

The aforementioned assemblies reduce hazard and prevent re-use of discarded needles.

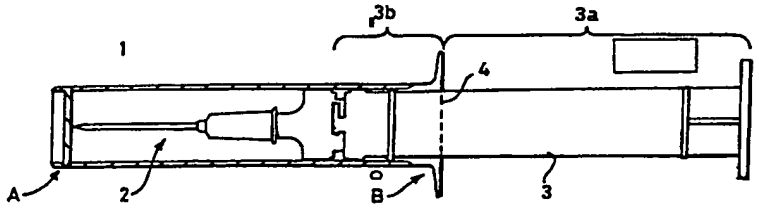


Fig. 3

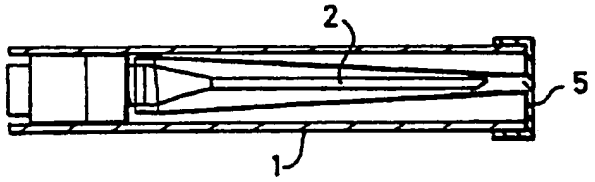


Fig. 4c

GB 2 287 192 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

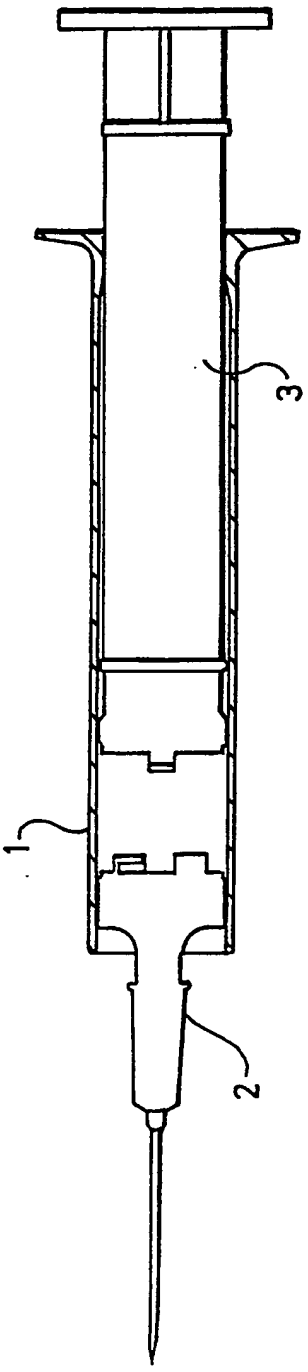


Fig. 1

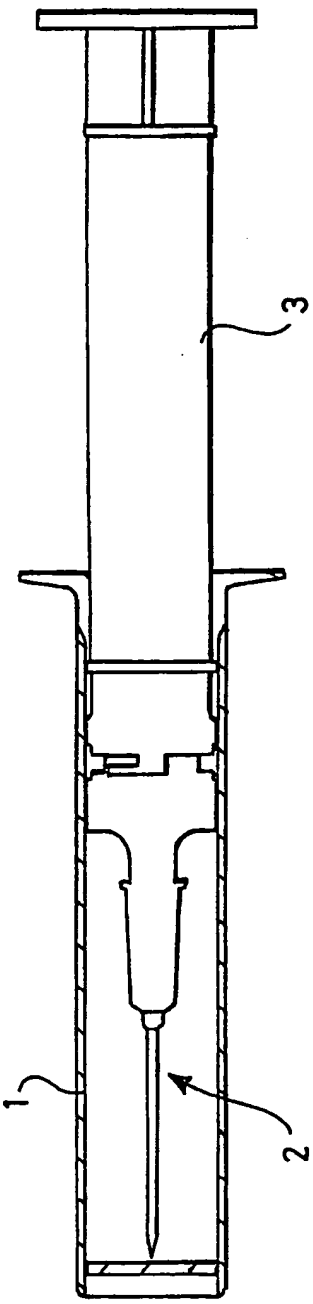


Fig. 2

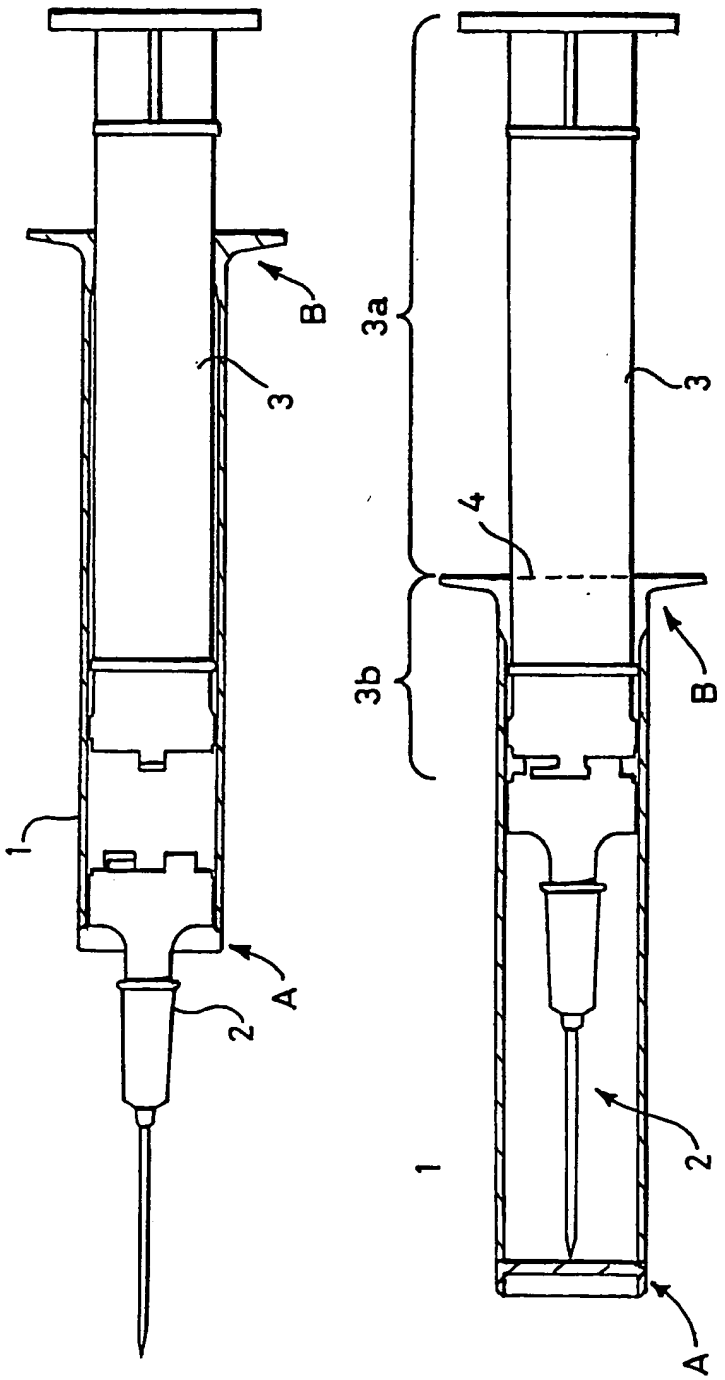


Fig. 3

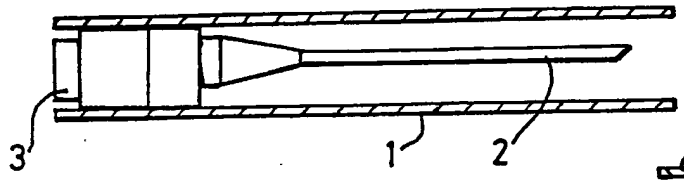


Fig.4a

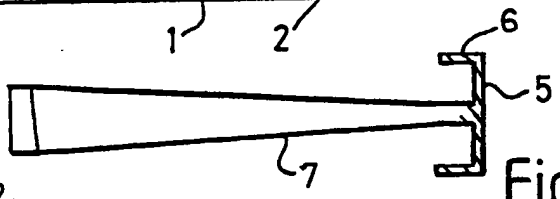


Fig.4b

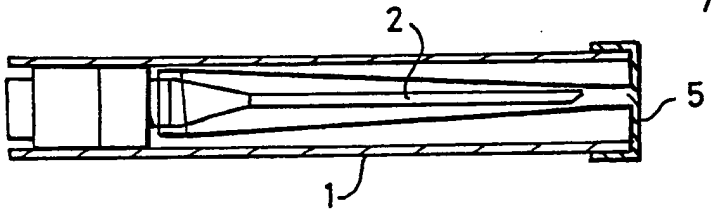


Fig. 4c

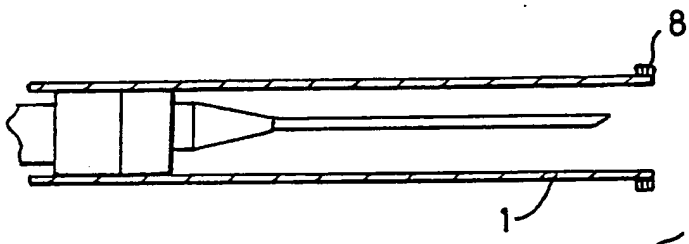


Fig. 5a

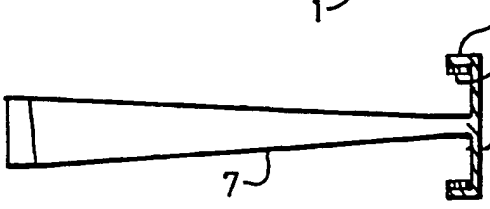


Fig.5b

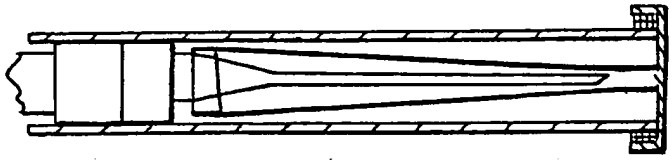


Fig.5c

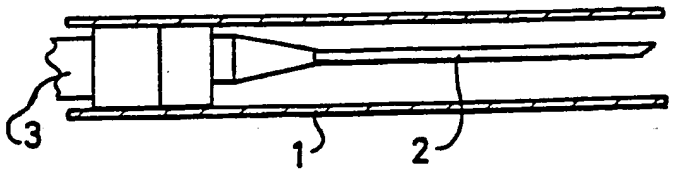


Fig. 6a

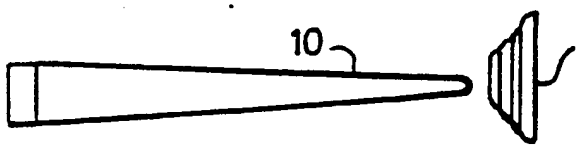


Fig. 6b

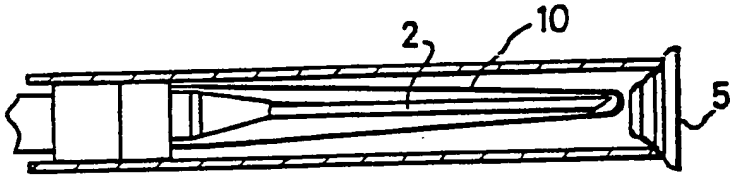


Fig. 6c

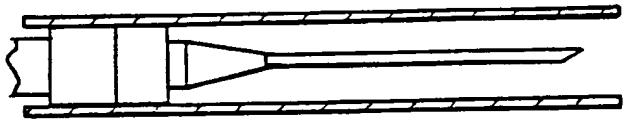


Fig. 6d

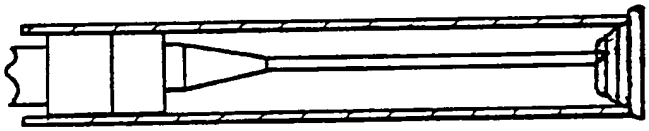


Fig. 6e

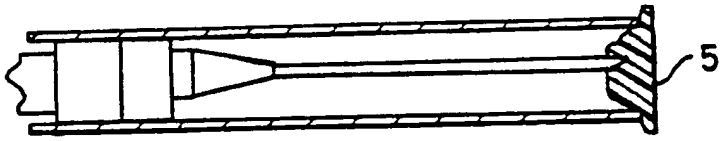


Fig. 6f

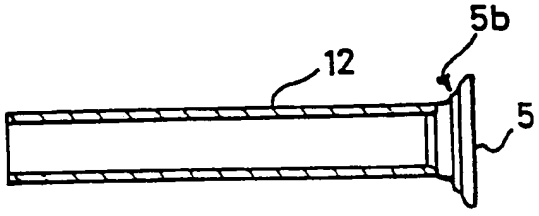


Fig. 7a

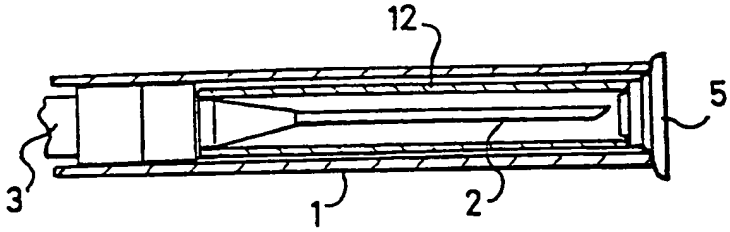


Fig. 7b

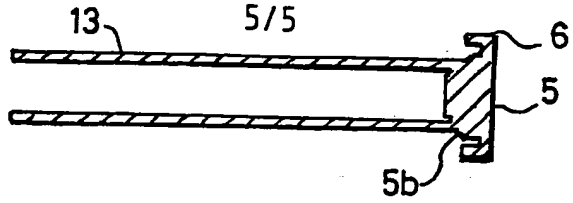


Fig. 8a

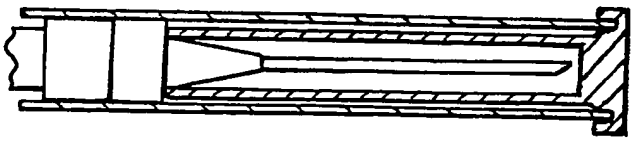
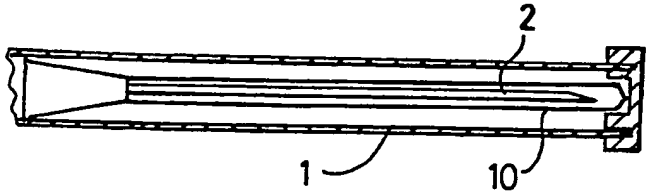


Fig. 8b



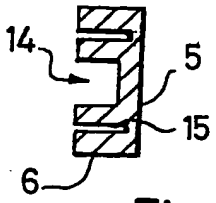


Fig. 9

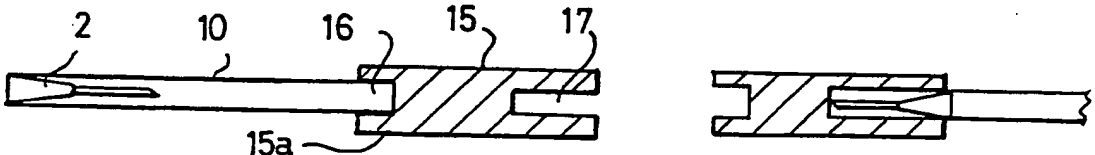


Fig. 10

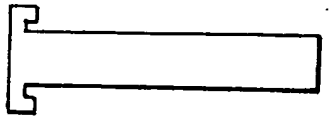


Fig. 11a

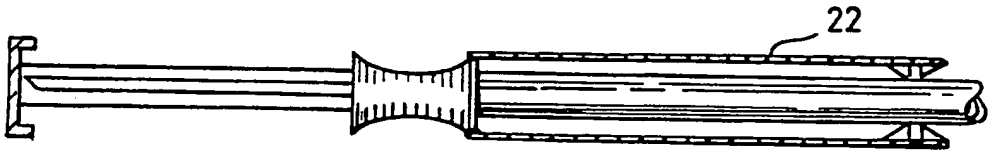


Fig. 11b

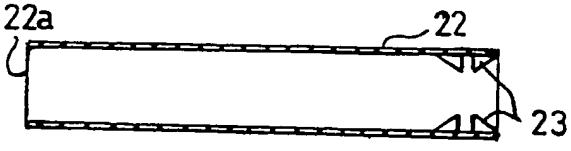
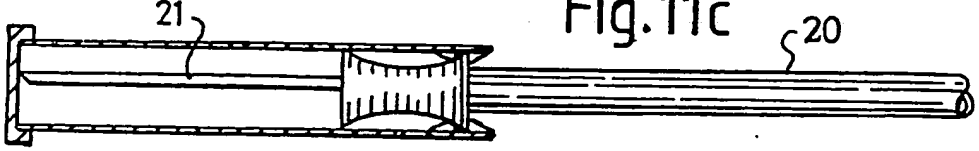


Fig. 11c



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Improvements Relating to Syringes

The invention relates to a syringe and an end cap for a syringe.

It is well-known that when surgical syringes are disposed of they should be treated with great care and pass through disposal systems which are designed to avoid any possibility of contamination. Despite this fact, it is known that used syringes are a health hazard and individuals who come into contact with such syringes may suffer illness through being cut by same. In addition, it is known that used syringes are typically used by groups of drug addicts thus increasing the possibility of contamination. More than ever, cross contamination is extremely dangerous because it is now a well established fact that infection by HIV virus is transmitted by the use of, or accidents with, syringes which have previously penetrated infected individuals.

There is therefore a need to provide syringes which cannot be used on more than one individual.

To some extent, safety has been increased by providing a syringe of the sort shown in Figures 1 and 2. The syringe comprises a conventional barrel 1 which has attached at a first end a needle 2 and at a second end a plunger 3. The syringe can be used in a conventional fashion, excepting that when a clinician has finished with the syringe, the plunger can be attached to the needle and the needle can subsequently be withdrawn into the barrel. In the embodiment shown in Figures 1 and 2 the means of attachment is a simple lock and turn mechanism. Withdrawal of the needle into the barrel results in the needle no longer being

exposed and therefore reduces the likelihood of an individual accidentally puncturing themselves with the needle. If preferred, a cap can be provided to seal the needle end of the barrel so ensuring that the needle is completely shielded.

However, although the above arrangement goes some way to increasing the safety of medical syringes, it is not foolproof. This is because it is not unknown for the end cap to come loose and thus leave the tip of a used needle relatively exposed. Moreover, with this arrangement it is possible for an individual to re-use the syringe by simply using the plunger to push the needle to the furthermost end of the barrel and then using the simple lock and turn mechanism the needle and plunger can be disengaged so as to facilitate use of the existing syringe.

With the above disadvantages in mind it is an object of the invention to provide a syringe and an end cap for a syringe which more effectively overcome the hazards associated with used syringes and which further prevents individuals from re-using a discarded syringe.

According to a first aspect of the invention there is therefore provided a syringe for use in medical applications comprising a barrel provided at a first end with a needle and at a second end with a plunger; a means for attaching the needle and plunger so that, after use, the needle can be withdrawn into the barrel characterised in that the syringe is further provided with detachment means whereby the section of the plunger extending beyond the barrel can be broken off thus rendering the syringe non-functional.

In a preferred embodiment of the invention the plunger is provided with lines of weakening ideally at a position where the plunger begins to extend beyond the barrel when the needle is withdrawn into the barrel.

In yet a preferred embodiment of the invention the barrel and/or plunger in the region where the plunger extends beyond the barrel when the needle is withdrawn into the barrel is provided with retractable or removable cutting means so that selective detachment of the said extending end of the plunger can take place when the needle has been withdrawn into the barrel.

The above aspects of the invention ensure that once a syringe has been used and the needle associated with same has been retracted into the barrel of the syringe then the means external of the barrel for manipulating the needle, ie the exposed plunger, is no longer available for use. As well as or instead of this embodiment of the invention there is also provided a second safety means comprising a specialised barrel end cap which ensures that the tip of a used and withdrawn needle is shielded.

According to an alternative aspect of the invention there is therefore provided a syringe for use in medical applications comprising a barrel provided at a first end with a needle and at a second end with a plunger and means for attaching the needle to the plunger so that, after use, the needle can be withdrawn into the barrel characterised in that the syringe further comprises an end cap adapted to fit on said first end of said barrel which end cap has, on its innermost side, a shielding means which projects from the end cap into the barrel whereby at least

the tip of the needle is surrounded by the shielding means.

In a preferred embodiment of the invention the shielding means projects substantially into the body of the barrel so as to shield the entire length of the needle.

In an alternative embodiment of the invention the shielding means comprises a resilient member which projects into said barrel along an axis aligned with the central longitudinal axis of said needle whereby, when in position, the needle is made to penetrate said resilient shielding means.

According to yet an alternative aspect of the invention there is provided a syringe for use in medical applications comprising a tube means provided at a first end with a needle and at a second end with dialysis apparatus or the like; and means for attaching the needle to a retraction device so that, after use, the needle can be withdrawn into the tube means characterised in that; there is further provided an end cap adapted to fit on said first end of said tube means which end cap has, on its innermost side, a shielding means which projects from the end cap into the tube whereby at least the tip of the needle is surrounded by the shielding means.

In the above described embodiment of the invention any suitable means may be provided for retracting the needle within the tube after use.

Embodiments of the invention will know be described by way of example only

and with reference to the accompanying Figures wherein;

Figure 3 represents a plan view of a syringe adapted in accordance with the invention;

Figures 4a, 4b and 4c represent a first end cap in accordance with the invention;

Figures 5a, 5b and 5c represent a second end cap in accordance with the invention;

Figures 6a, 6b, 6c, 6d, 6e and 6f represent a third end cap in accordance with the invention;

Figures 7a and 7b represent a fourth end cap in accordance with the invention;

Figures 8a and 8b represent a fifth end cap in accordance with the invention;

Figure 9 represents a sixth end cap in accordance with the invention; and

Figure 10 represents a seventh end cap in accordance with the invention.

Figure 11a, 11b and 11c represent an eighth end cap in accordance with the invention.

Referring to the Figures and firstly to Figure 3, there is shown a syringe for use

in medical applications comprising a barrel 1, a needle 2 which is adapted to slidably move within barrel 1 and a plunger 3 which is also adapted to move within barrel 1. Furthermore, as previously mentioned, needle 2 and plunger 3 are provided with any form of suitable attachment means whereby needle 2 and barrel 3 can be linked together so that when the syringe has been used needle 2 can be withdrawn into the main body of barrel 1 using plunger 3. When this has been completed, to a substantial extent, the tip of needle 2 is relatively shielded by the barrel 1. However, it can be seen that it is possible to extend needle 2 with respect to barrel 1 by reinserting plunger 3 into barrel 1. It is therefore possible to re-use the syringe by following extension of needle 2 with uncoupling of needle 2 and plunger 3. To prevent this happening, plunger 3 is provided with lines of weakening 4 which enable a user to break off the exposed end 3a of plunger 3 thus leaving only a short fraction 3b of plunger 3 remaining inside barrel 1. It follows that when this action is complete it is no longer possible to uncouple needle 2 and plunger 3 and what is more it is extremely difficult to extend needle 2 with respect to barrel 1.

The positioning of lines of weakening 4 along the length of plunger 3 is largely determined by the amount of plunger 3 extending beyond barrel 1 when needle 2 is withdrawn into barrel 1. It is advantageous to ensure that lines of weakening 4 are provided on plunger 3 as near as possible to the end of barrel 1 in which the plunger is located. In preferred embodiments of the invention markings or guides may be provided so as to guide a user thus ensuring that needle 2 is withdrawn into barrel 1 by a predetermined amount prior to the breaking off of plunger 3. For example, an indicator may be provided on barrel 1 so that a user

can ensure that a preselected point of needle 2 is aligned with the indicator before the extended portion of plunger 3 is broken off.

Although this embodiment of the invention has been described with particular reference to lines of weakening 4 it is also within the scope of the invention to provide other means for breaking off the extended portion 3a of plunger 3 when needle 2 is withdrawn into barrel 1. For example, removable or retractable cutting means may be provided adjacent the plunger end B of barrel 1 so that a user may break off a portion of plunger 3 when a sufficient amount of retraction of needle 2 has taken place within barrel 1. In this alternative embodiment of the invention it will not be necessary to provide guide or indicator means as aforedescribed.

In addition to the above aspect of the invention there is also provided a second safety measure comprising a modified end cap which is adapted to fit on needle end A of barrel 1 after a needle has been retracted within said barrel. The end cap of the invention is adapted not only to seal the exposed end A of the barrel but also to shield the tip of needle 2 within barrel 1.

Examples of various embodiments of the invention will now be described.

Referring firstly to Figures 4a, 4b and 4c there is shown in Figure 4a a needle 2 which has been withdrawn into barrel 1 of a syringe so that the tip of needle 2 is relatively shielded by barrel 1. Furthermore, the exposed end of plunger 3 has been broken off so that this syringe cannot be used. In Figure 4b there is shown an end cap for use with the syringe illustrated in Figure 4a. The end cap

comprises a circular seal 5 having an annular rim 6 depending therefrom. In addition, on the innermost side of the end cap there is provided a centrally mounted conical shielding means 7 which also depends from end cap 5 such that the widest portion of means 7 is furthest from end cap 5. The size and shape of means 7 is adapted to fit over needle 2. Thus when the end cap shown in Figure 4b is placed on the syringe shown in Figure 4a the configuration shown in Figure 4c is achieved whereby rim 6 overlies the upper outermost edges of barrel 1 and means 7 overlies needle 2 located within barrel 1. In this arrangement needle 2 is shielded such that if end cap 5 is loosened or removed, the tip of needle 2 is not exposed.

Referring now to Figures 5a, 5b and 5c there is shown an alternative end cap in accordance with the invention. As shown in Figure 5a the uppermost outermost edge of barrel 1 is provided with an annular seal 8. In addition, the end cap shown in Figure 5b which is substantially similar to the end cap described above with reference to Figure 4b is provided with a circular seal 5 and depending therefrom an annular rim 6 and a shielding means 7. In addition, the innermost edge of rim 6 is provided with a seal 9 adapted to frictionally mate with seal 8 provided on barrel shown in Figure 5a. Thus when the end cap shown in Figure 5b is placed in mating engagement with the syringe shown in Figure 5a seals 8 and 9 engage so as to provide a tight fit and thus safeguard against end cap 5 being removed from barrel 1. This arrangement is shown in Figure 5c.

In an alternative embodiment of the invention seals 8 and 9 may be replaced by screw threaded arrangements such that the end cap can be screwed onto the end

of the syringe.

Referring now to Figures 6a, 6b, 6c, 6d, 6e and 6f there is shown yet an alternative embodiment of an end cap in accordance with the invention.

Referring firstly to Figures 6a, 6b and 6c there is shown a needle 2 which has been withdrawn into barrel 1 using plunger 3. The extended end of plunger 3 has been broken off. Needle 2 is provided with a conical shielding means 10 which is sized and shaped to fit over needle 2. In addition, there is provided an end cap which comprises a circular seal 5 whose diameter is slightly greater than the diameter of barrel 1. On the innermost side of seal 5 there is provided a conical tapering projection which is adapted so that the end cap can be pushed onto barrel 1 to provide a friction fit.

In Figures 6d, 6e and 6f there is shown an alternative arrangement where an end cap is provided with a circular seal 5 of slightly larger diameter than barrel 1 and on its innermost side a conical tapering projection. In this alternative embodiment the projection is either hollow (Figure 6e) or is made of a flexible or resilient material such as rubber (Figure 6f). Moreover, the projection is of such length that when the end cap is positioned on the barrel the tip of needle 2 is made to either fit inside or puncture the projection according to the nature of same. In this way, needle 2 is used to hold end cap 5 in position.

Referring now to Figures 7a and 7b there is shown yet a further alternative embodiment of the invention comprising an end cap having an outermost circular

seal 5 and on the innermost side of seal 5 there is provided a conical tapered projection 5b. Moreover, attached to the outermost end of projection 5b is a cylindrical member 12. Member 12 is sized and shaped such that when the end cap is positioned on barrel 1, needle 2 is shielded by member 12. It is also of note that member 12 is spaced from the outermost end of end cap 5 by projection 5b so that it does not interfere with the sealing of end cap 5 against barrel 1.

Referring now to Figures 8a and 8b there is shown a yet alternative embodiment of the invention which comprises the provision of an end cap having a circular seal 5 and depending therefrom an annular rim 6. Furthermore, on the innermost surface of seal 5 there is provided a hollow annular projection 13 which is sized and shaped so that projection 13 fits over the length of needle 2. Projection 13 is mounted on an inwardly tapering projection 5b attached to the innermost side of seal 5 so that the diameter of member 13 is less than that of seal 5. Thus when the end cap is mounted on barrel 1 member 13 not only overlies needle 2 but it also is spaced from the innermost walls of barrel 1.

Referring now to Figure 9 there is shown yet an alternative end cap which comprises seal 5 having depending therefrom an annular rim 6 defining a central aperture 14. The diameter of aperture 14 is less than the diameter of barrel 1. Rim 6 is provided with an annular slot 15 which penetrates to a substantial depth, but not all, of rim 6. The diameter of slot 5 is substantially equal to the diameter of barrel 1 such that the end cap can be located on barrel 1 by positioning the upper outermost rim of barrel 1 within annular slot 15. Moreover, the diameter of recess 14 is such that it accommodates needle 2 when covered with a

conventional needle guard 10.

Referring now to Figure 10 there is shown yet an alternative embodiment in accordance with the invention which comprises a solid tubular member 15 provided on a first transverse edge with a centrally located circular recess 16 defined by annular rim 15a. A similar circular recess is provided on the opposite transverse end excepting that this recess 17 is of a greater depth than recess 16 but of a smaller diameter than recess 16. The diameter of tube 15 is slightly less than the diameter of barrel 1 such that, in use, the member can be push-fitted within the end of barrel 1 and recess 16 is adapted to accommodate guard 10 of needle 2. Recess 17 is adapted to accommodate a projection means extending from the innermost surface of a conventional push fit end cap. Thus tube 15 serves as an intermediary plug or end cap holding needle 2 and a further end cap, as described above, in position within barrel 1.

Referring now to Figures 11a, 11b and 11c there is shown yet an alternative embodiment of the invention which concerns the use of a syringe with the flow of extra corporeal blood, ie dialysis, aphemisis and blood giving/donation. In this embodiment, a disposable plastic tubing 20 is provided at a first end with a needle 21 and at a second end with suitable dialysis apparatus or the like (not shown). Further, a plastic sheath 22 which is shaped and sized so as to fit over the needle end of tube 20 and further to provide clearance thereabout, is fitted to the end of tube 20 and held in place via attachment means such as deflectable sliders 23. After the syringe has been used needle 21 is withdrawn into sheath 22 by pulling tube 20 so that it slides rearwardly with respect to sheath 22 and over deflectors

23. When syringe 21 has been pulled sufficiently within sheath 22 an end cap as described in any of the above embodiments is attached to the outermost end 22a of sheath 22. It is envisaged that the end cap shown in Figure 6f would be suitable because it would ensure that the tip of the syringe needle 21 would be secured within a resilient member and so prevent blood loss from the system which, in the instance of this apparatus, would be much greater than leakage from a conventional syringe.

Using any one of the end caps in accordance with the invention, a needle which has been withdrawn into the barrel of a syringe can be shielded from a user so as to minimise the possibility of a user being cut or punctured by a used syringe. Moreover the provision of a plunger which can, in part, be detached ensures that once a needle has been withdrawn into a barrel of a syringe the needle cannot subsequently be re-used.

CLAIMS

1. A syringe for use in medical applications comprising a barrel provided at a first end with a needle and at a second end with a plunger; and means for attaching the needle and plunger so that, after use, the needle can be withdrawn into the barrel characterised in that the syringe is further provided with a detachment means whereby the section of the plunger extending beyond the barrel can be broken off for rendering the syringe non-functional.

2. A syringe according to Claim 1 wherein the plunger is provided with lines of weakening.

3. A syringe according to Claim 2 wherein the said lines of weakening are provided in the vicinity where the plunger extends beyond the barrel when the needle is withdrawn into the barrel.

4. A syringe according to any preceding claim wherein the barrel is provided with retractable or removable cutting means so that selective detachment of the end of the plunger extending beyond the barrel can take place when the needle has been withdrawn into the barrel.

5. A syringe according to any preceding claim wherein there is further provided an end cap adapted to fit on said first end of said barrel, which end cap has, on it's innermost side, a shielding means which projects from the end cap into the barrel whereby at least the tip of the needle is surrounded by the shielding means.

6. A syringe according to Claim 5 wherein the shielding means projects

substantially into the body of the barrel so as to shield the entire length of the needle.

7. A syringe according to Claims 5 and 6 wherein the shielding means comprises a resilient member which projects into said barrel along an axis aligned with the central longitudinal axis of said needle whereby when in position the needle is made to penetrate said resilient shielding means.

8. A syringe for use in medical applications comprising a tube means provided at a first end with a needle and at a second end with a dialysis apparatus or the like and means for attaching the needle to a retraction device so that, after use, the needle can be withdrawn into the tube means characterised in that; there is further provided an end cap adapted to fit on said first end of said tube means, which end cap has, on it's innermost side, a shielding means which projects from the end cap into the tube whereby at least the tip of needle is surrounded by the shielding means.

9. A syringe as substantially herein described and/or with reference to the accompanying figures.

10. An end cap as substantially herein described and/or with reference to the accompanying figures.

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Examiner's report to the Comptroller under Section 17 (15)
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Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) NONE

Documents considered relevant following a search in respect of Claims :-
1 TO 7

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

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&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 672393	(ABBOTT LABORATORIES) page 1 lines 18 to 23 and lines 72 to 89, Figures 2 and 3	7
X	EP 0282097 A1	(HABLEY MEDICAL TECHNOLOGY) column 2 line 20 to column 3 line 10 and Figure 3	1,2,3
X,Y	EP 0278493 A2	(HABLEY MEDICAL TECHNOLOGY) column 2 line 3 to column 3 line 4 and Figures 12 to 17	1,5,6,7
E,X	WO 94/05356 A1	(U.S. MEDICAL INSTRUMENTS) page 4 line 3 to page 5 line 2 and Figure 12	1,2,3,5,6
X	WO 91/00750 A1	(WILLIAMS) page 2 line 4 to page 3 line 9 and Figure 5	1,2,3
X	US 5188601	(KING) column 2 line 45 to column 3 line 38 and Figure 5	1,2,3
X	US 4935015	(HALL) column 3 lines 36 to 68, column 6 lines 34 to 38 and Figure 3	1,2,3
X	US 4826484	(HABER) column 1 line 62 to column 2 line 46 and Figure 3	1,2,3

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).